

## Feasibility and outcome of a web-based self-help intervention for depressive symptoms in patients with multiple sclerosis: A pilot study

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### ABSTRACT

**Background:** Depressive symptoms are highly prevalent among patients with multiple sclerosis (MS). Web-based problem solving therapy (PST) is easily accessible and showed to be effective in depressed patients.

**Objectives:** The aims of this pilot study were to examine feasibility and outcome (reduction of depressive symptoms) of an applied web-based PST intervention in MS patients.

**Methods:** Forty-four MS patients with mild to severe depressive symptoms followed a web-based PST intervention. Feasibility was measured by compliance rate and satisfaction scales. The Beck Depression Inventory (BDI-II) was used to measure depressive symptoms before and after the intervention.

**Results:** The compliance rate was 52%, and 85% of the patients rated the quality of the intervention as good or excellent. After the intervention, depressive symptoms had significantly decreased (BDI-II change: mean = −3.9,  $p = 0.01$ ,  $d = 0.51$  in intention-to-treat analysis; BDI-II change: mean = −9.0,  $p < 0.001$ ,  $d = 1.50$  in completers analysis).

**Conclusions:** This study suggests that applied web-based PST is feasible and reduces depressive symptoms in MS patients. Especially MS patients who experience disease-related or other barriers to participate in face-to-face counselling could benefit. However, ways to increase compliance should be considered. A randomized controlled trial is recommended to more extensively investigate effectiveness of this intervention in treating depressive symptoms in MS patients.

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### 1. Introduction

Depressive symptoms are highly prevalent in patients with multiple sclerosis (MS). Lifetime risk for depression in the MS population has been estimated at around 50%, compared with 10–15% in the general population [1,2]. Depression is related to poorer quality of life, disrupts social support and family systems, and has been associated with fatigue, a cutback in working hours and cognitive impairment in MS patients [1]. The risk of suicide is 2.3 times elevated in the MS population [3], with the most important risk factor for suicide being a depressive episode [4]. Furthermore, depression can result in decreased adherence to MS treatment, which may affect health status adversely [5]. It remains unclear whether depressive symptoms in patients with MS

are primarily reactive in nature as a response to the unpredictable and uncertain course of the disease, or whether neurobiological factors play a part [1,6].

More than half of the cases of depression in MS patients are underdiagnosed [7,8]. Possible reasons could be that patients perceive their emotional problems as an unsolvable component of the disease process, therefore leaving them unmentioned in the consulting room of the physician. In addition, mental problems are not the primary focus of physicians and general practitioners [9]. Besides, if depressive symptoms are recognized, adequate treatment often tends to be lacking [1,10].

A number of clinical trials on cognitive behavior therapy (CBT) have shown that psychotherapy is an effective treatment for depression in patients who suffer from MS [9,11,12]. This applies especially to depression treatment that focuses on developing skills to cope with the unpredictable and uncertain course of MS and its consequences [9,13]. Problem solving therapy (PST), comprising a cognitive behavioral method, is based on the assumption that psychological symptoms of depression are often caused by (practical) problems people face in their

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daily lives combined with poor problem-solving skills. PST helps people to solve these problems in a structured way by teaching them more adequate problem-solving skills [14,15]. Several studies found PST to be effective in the treatment of depression [16,17]. However, MS patients can experience additional difficulties in attending psychotherapy treatment due to disease-related factors such as fatigue, physical impairments and transportation difficulties. These complicating factors seem to have a major impact on receiving face-to-face treatment [12,18].

To avoid the aforementioned barriers that hamper ordinary psychotherapeutic treatment, other forms of treatment delivery can be introduced such as brief sessions, therapy by telephone or more self-help orientated alternatives. During the past years there has been a significant increase in the use of telecommunication to provide self-help oriented psychotherapy for a wide range of psychiatric conditions. Recent findings show that CBT provided by telephone or using the Internet is an effective method of treatment for depression in general [19–21]. In depressed MS patients, Mohr and colleagues found a significantly larger decrease of depressive symptoms in those receiving a telephone-administered CBT compared to those receiving supportive emotion-focused therapy [18] or no mental healthcare at all [22].

These forms of treatment may result in a reduction of treatment time, commuting time, and treatment costs. Furthermore, they are easily accessible and have the advantage of reaching a large number of people with functional impairments due to physical health problems. Although web-based CBT has demonstrated to be effective in reducing depressive symptoms, evidence is lacking whether this also applies to depressive symptoms in MS patients.

Therefore, the aim of our pilot study is 1) to explore the feasibility of using the Internet and PST as an alternative treatment opportunity for reducing depressive symptoms in MS patients, and 2) to examine the outcome of the intervention on symptoms of depression and on additional measures of anxiety, quality of life, physical functioning and problem-solving skills. If the web-based PST intervention would turn out to be feasible with a positive outcome, a new treatment for depressive symptoms in MS patients would become within reach.

## 2. Methods

### 2.1. Patients

The VU University Medical Center Amsterdam, the Netherlands, provided a database containing all patients with definite MS who visited the Department of Neurology in 2008. From May to September 2009, 206 MS patients were recruited from this database. Another 31 patients with MS registered for this study through advertisement in MS newsletters, and 23 MS patients were directly referred by their neurologists at the VU Medical Center.

All patients received a mailing with a username and password to fill out an online version of the Beck Depression Inventory (BDI-II) [23,24], as an initial screening questionnaire on depressive symptoms. Patients were included in the study if they [1] were 18 years or older, [2] scored 16 or higher on the BDI-II and [3] reported a diagnosis of MS confirmed by a neurologist (> 3 months ago). Potential participants were excluded if they were currently receiving psychotherapy, did not have access to the Internet, were physically unable to attend an online intervention or reported suicidal ideation. A reminder phone-call was used to enhance the response rate.

### 2.2. Flow of patients

Two hundred sixty MS patients received an invitation to fill out the depression screening questionnaire, the response rate was 58% ( $n = 150$ ). Fifty four of the responding MS patients had a mild to severe depression according to their score on the Beck Depression Inventory (BDI-II  $\geq 16$ ); the other 96 patients (BDI-II  $< 16$ ), were excluded. Four of the remaining 54 patients were excluded because they were

receiving psychotherapy, two were physically unable to attend an online intervention, and four finally refused to participate. The remaining 44 patients consented to participate in the pilot study. Fig. 1 describes the flow of patients.

### 2.3. Procedures

We conducted a pilot study with one condition. The protocol of the study was approved by the medical-ethical committee of the VU University Medical Center Amsterdam. Patients meeting inclusion criteria received a letter concerning the research, content of the intervention and an informed consent form. After giving informed consent, patients were invited to fill out a set of online questionnaires to obtain baseline data. Finally, the depression and anxiety section of the World Health Organization's Composite International Diagnostic Interview (WHO CIDI, 1990) [25] was conducted by telephone. Patients then received a password and username to access the online self-help intervention from their personal computers via the Internet. Inclusion time to the intervention was from April to November 2009. The PST intervention (duration: 5 weeks), is further described in the section 'Intervention'. At completion of the web-based PST intervention, patients filled out the online questionnaires of the post-intervention assessment. The patients who did not complete the intervention received an invitation for the post-intervention assessment 10 weeks after the baseline measurement. Participation in the study did not interfere with the ongoing MS treatment in any way.

## 3. Measures

### 3.1. Feasibility

Feasibility was measured by compliance rate and a self-designed 10 point Visual Analogue Scale (VAS) to evaluate the opinion of patients about the website, support and the total intervention. We additionally used the Client Satisfaction Questionnaire (CSQ-8) [26] to check whether patients were satisfied with the care they received. The CSQ-8 has a maximum achievable score of 32. For the VAS and the CSQ-8, higher scores indicate more satisfaction.

### 3.2. Outcome

The Beck Depression Inventory [23,24] was used to measure depressive symptoms. This self-report instrument is the most commonly used measure of depression severity in patients with MS [1], and has shown to be valid and reliable [27,28]. We used the Beck Depression Inventory Second Edition (BDI-II) [23] which is the most recent version of the BDI. It consists of 21-items measuring symptoms of depression, such as pessimism, sense of failure, guilt, self-dislike, suicidal ideas, insomnia and weight loss. The total score is calculated as the sum score of all items and ranges 0 to 63. Sum scores of 0–13 represent minimal depressive

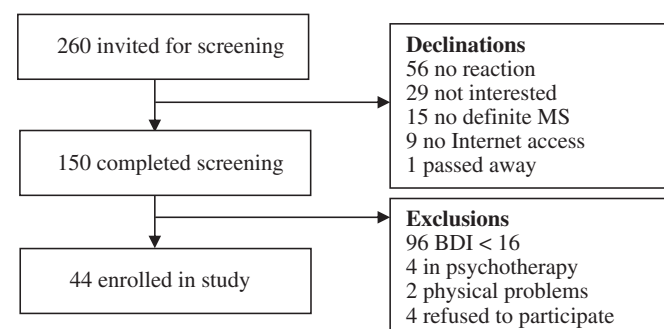


Fig. 1. Patients' flow.

symptoms, 14–19 mild depression, 20–28 indicate moderate depression and 29–63 severe depression.

A number of additional outcome measures were employed. The anxiety subscale of the Hospital Anxiety and Depression scale (HADS) [29] was used to assess the presence of anxiety symptoms. This scale consists of 7 items, with scores ranging from 0 to 21 with higher scores indicating more anxiety. Since we already used the BDI-II to measure depressive symptoms, the HADS was only used to measure anxiety symptoms. In addition, we used the physical functioning subscale of the Medical Outcome Study Short Form 36 (SF-36) [30] and the EuroQol quality of life measure [31], comprising a five-part questionnaire (EQ-5D) and a visual analogue self-rating scale (EQ-VAS). Patients' problem-solving skills were evaluated by the Social Problem Solving Inventory Revised (SPSI-R) [32]. The SPSI-R consists of the following subscales: negative and positive problem orientation (NPO, PPO), rational problem solving (RPS), impulsivity/carelessness style (ICS) and avoidance scale (AS). All questionnaires were administered via the Internet.

### 3.3. Other variables

A clinical diagnosis of Major Depression Disorder and/or Anxiety Disorder according to DSM-IV-TR criteria was assessed by a telephone interview using the WHO CIDI [25]. Finally, socio-demographic and medical MS data (i.e. year of diagnosis, onset of first symptoms, medication usage, type of MS) were collected by online self-report.

### 3.4. Intervention

The online cognitive-behavioral self-help intervention examined in this study is based on what is known as 'problem-solving therapy' (PST) [14]. We adjusted the original online PST-based intervention for depression as described by van Straten et al. [33] for MS patients with comorbid depression. Modifications concerned additional information about MS and its psychosocial consequences, and adjustment of text and examples. The intervention consisted of five modules containing text, exercises and examples. Patients were asked to work on one module a week and exercise for at least 2 h a week. Support during the intervention consisted of communication via the website through brief, weekly e-mails, and was provided by supervised and trained master's clinical psychology students. The e-mail correspondence was intended to facilitate the patient's effective use of the self-help method, and was explicitly not intended to build up a patient-therapist relationship.

### 3.5. Statistical analyses

We compared baseline characteristics for patients who completed the intervention (completers) and patients who did not (non-completers): by performing chi-square comparisons for dichotomous variables and independent t-test statistics for continuous variables.

Descriptive statistics of compliance rate and satisfaction were used to explore the feasibility of web-based PST as an alternative treatment opportunity for MS patients with co-morbid depressive symptoms. Paired t-tests were performed to assess changes between pre-intervention and post-intervention in order to determine the improvement of patients during the intervention. We used both intention-to-treat (ITT) analyses and completers analyses. In the ITT analyses, the conservative Last Observation Carried Forward method (LOCF) was used to impute data for those who did not complete post-intervention assessments ( $n=4$ ). To evaluate the magnitude of the improvement of the intervention on outcome measures, effect sizes were calculated for all patients and for completers only, using Cohen's formula [34]. Effect sizes were calculated by subtracting the post-intervention values from the pre-intervention values, divided by the pooled standard

deviation. Effect sizes of 0.56 or higher can be assumed to be large, while effect sizes of 0.33–0.55 are moderate, and effect sizes of 0–0.32 are small.

We used the method of Jacobson and Truax [35] to measure the proportion of participants who improved and recovered. The reliable change index (RCI) [35] was used to determine statistically significant change in the BDI-II from pre-intervention to post-intervention, at the level of individual patients. The RCI was determined by subtracting a patients' post-intervention score from the pre-intervention score and dividing it by the standard error of difference between the two test scores. Patients are seen as improved if the RCI is higher than 1.96, since it would be unlikely that this change occurs by chance. A decrease of 3.7 or more on the BDI-II implies in this case statistically reliable change. Finally, recovery from depressive symptoms was defined as reliable change *plus* a score of 13 or lower on the BDI-II [36].

## 4. Results

### 4.1. Patients

Baseline characteristics of the 44 enrolled patients are displayed in Table 1. Mean age was 45 years and the majority of patients were female (77%) and married (68%). Education level was almost evenly distributed in the study population with 43% lowly educated (<15 years) and 57% highly educated ( $\geq 15$  years). Time since MS diagnosis ranged from 2 to 40 years (median = 5 years). Almost half of the patients (48%) had the relapsing-remitting type of MS, 23% the secondary-progressive type and 18% the primary-progressive type of MS. For 11%, the type of MS was not reported.

Chi-square analyses and analyses of variance revealed no differences in baseline characteristics between patients who completed the intervention and patients who did not, except for the BDI-II. Baseline BDI-II scores of completers were significantly higher compared to non-completers (mean = 23 vs mean = 17,  $p=0.01$ ).

### 4.2. Feasibility

#### 4.2.1. Compliance rate

The compliance rate for the web-based PST intervention was as follows: 91% completed the assignments of module 1, 70% additionally completed module 2, 64% completed module 3, and 52% completed the whole course (none of the patients dropped out between modules 4 and 5). We clustered the reported reasons of non-completers for early termination of the intervention ( $n=21$ ). For 24%, computer-related problems were the main reason to drop out of the intervention and 14% reported a lack of time and being too busy to finish the intervention. Around 24% stopped the intervention because of psychosocial and environmental problems as job loss, an ended relationship and personal or family matters. Other reasons (24%) were MS related problems as too much pain, illness, being too depressed, the intervention not meeting someone's needs and wanting to finish the intervention in their own time. For 14%, reasons for dropout were unknown.

#### 4.2.2. Satisfaction

The CSQ-8 showed that 85% of the patients ( $n=40$ ) rated the quality of the web-based intervention as good or excellent. The majority of patients were satisfied with the amount of help they had received (77.5%) and thought the web-based intervention had helped them to deal with their emotional problems (75%). Around 62% reported that the web-based PST had met their needs and 82.5% would recommend this kind of therapy to others. Finally, 60% of the patients would use the same intervention if they needed help again. The mean CSQ-8 score in the total sample was 23.6 (sd 4.8, range = 11–31). Patients who completed the intervention expressed greater satisfaction with the intervention than non-completers (mean = 26.1 vs mean = 20.1,  $p<0.001$ ). Patients gave their opinion about the website, support and total intervention on a

**Table 1**  
Demographic characteristics.

Characteristics	All patients (n = 44) mean (sd) or %	Completers (n = 23) mean (sd) or %	Non-completers (n = 21) mean (sd) or %	p-value
Age, years	45 (12)	46 (11)	45 (13)	0.64
Sex, women	77	78	76	0.87
Education				0.74
Lower	43	48	43	
Higher	57	52	57	
Marital status				0.47
Married	68	74	62	
Unmarried	32	26	38	
Years since MS onset				0.63
Median (range)	5 (2–40)	5 (2–19)	3 (2–40)	
Type of MS				0.24
Relapsing–remitting	48	52	44	
Secondary progressive	23	19	26	
Primary progressive	18	10	26	
Unknown	11	19	4	
MS medication				
Disease modifying	60 (n = 40)	61	59 (n = 17)	0.38
Symptom relief	45 (n = 40)	43	47 (n = 17)	0.72
Psychotropic medication, yes	21	26	14	0.33
Diagnose CIDI				0.12
Depression	18	11	7	
Anxiety	2	2	0	
Depression and anxiety	10	6	4	
No diagnosis	14	4	10	
BDI-II pre-intervention	20 (7)	23 (7)	17 (7)	0.01
HADS pre-intervention	9 (3)	9 (3)	9 (3)	0.60
SF36pf pre-intervention	42 (32)	38 (30)	45 (34)	0.49
SPSI-R pre-intervention				
PPO	11 (3)	10 (3)	11 (2.6)	0.16
NPO	18 (5)	20 (5)	16 (6)	0.06
ICS	17 (5)	17 (5)	16 (5)	0.31
RPS	37 (9)	36 (9.3)	38 (9)	0.50
AS	11 (4)	12 (4)	10 (4)	0.12
EuroQol pre-intervention				
EQ-5D	0.56 (0.3)	0.58 (0.3)	0.54 (0.3)	0.66
EQ-VAS	62 (17)	61 (20)	63 (14)	0.75

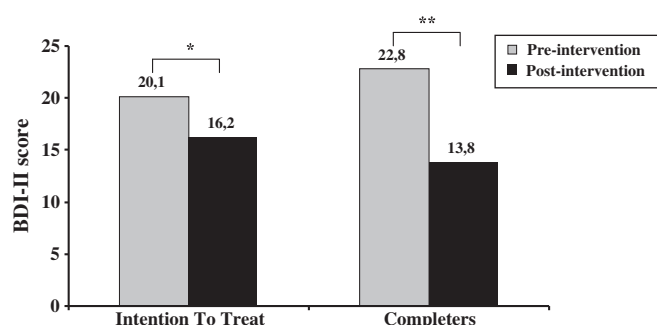
MS = multiple sclerosis, CIDI = composite international diagnostic interview, BDI-II = Beck Depression Inventory, second edition, HADS = Hospital Anxiety and Depression Scale, SF36pf = Short Form-36 physical functioning subscale, SPSI-R: PPO = positive problem orientation; NPO = negative problem orientation; RPS = rational problem solving; ICS = impulsivity/carelessness style; AS = avoidance style, EQ-5D = EuroQol-5D, EQ-VAS = EuroQol-Visual Analogue Scale.

self-designed 10 point Visual Analogue Scale. Support from the coach received the highest rank, i.e. 7.7 (sd 1.2), the website scored 7.2 (sd 1.1) and the total intervention scored 7.2 (sd 1.3). Differences in VAS score between completers and non-completers were significant (mean = 8.2 vs mean = 6.9,  $p = 0.002$ , mean = 7.5 vs mean = 6.7,  $p < 0.05$ , mean = 7.7 vs mean = 6.6,  $p = 0.01$ ).

#### 4.3. Outcome

##### 4.3.1. ITT and completers analyses

ITT analyses ( $n = 44$ ) revealed a significant reduction in depressive symptoms measured by the BDI-II. Fig. 2 shows that the mean score of



**Fig. 2.** Depressive symptoms before and after the web-based intervention. \* $p = 0.01$ ,  $d = 0.51$ , \*\* $p < 0.001$ ,  $d = 1.5$ .

depressive symptoms for all patients decreased from 20.1 to 16.2 with a Cohen's  $d$  of 0.51 ( $p = 0.01$ ). Completers analyses ( $n = 23$ ) revealed a more pronounced decrease (from 22.8 to 13.8,  $p < 0.001$ ) in depressive symptoms on the BDI-II with an effect size of Cohen's  $d = 1.50$ . After correction for baseline BDI-II scores, there was a significant difference in BDI-II change scores between completers (mean =  $-7.9$ ) and non-completers (mean =  $0.61$ ) ( $p < 0.001$ ). Post-hoc analyses revealed that patients with a CIDI diagnosis of Major Depression Disorder and/or Anxiety Disorder ( $n = 30$ ) showed a significant reduction of depressive symptoms (mean BDI-II change =  $-5.5$ ,  $p = 0.002$ ), with an effect size of 0.74.

Table 2 presents mean pre- and post-intervention scores (sd),  $t$  values and effect sizes for additional outcome measures. Completers analyses but not ITT analyses revealed a significant decrease in anxiety measures ( $p = 0.004$ ) with a Cohen's  $d$  of 0.71. Regarding problem-solving skills, the whole sample revealed a decrease in negative problem orientation ( $p = 0.004$ ;  $d = 0.41$ ), which was larger for patients who completed the intervention ( $p = 0.001$ ,  $d = 0.77$ ). Additionally, after the intervention, completers scored higher on positive problem orientation ( $p = 0.04$ ) and rational problem solving ( $p = 0.02$ ). Finally, the intervention did not seem to have any positive or negative consequence for scores on physical functioning and quality of life scales, and other subscales of the SPSI-R.

##### 4.3.2. Significance for individual patients

Based on the RCI, 47.7% of all patients ( $n = 44$ ) showed a significant improvement in depressive symptoms after the intervention. Seventy-



**Table 2**Pre-intervention and post-intervention mean scores, standard deviations (sds), *p* and *t* values and effect sizes for additional outcome measures.

Measure	ITT (n = 44)					Completers (n = 23)				
	Pre-intervention mean (sd)	Post-intervention mean (sd)	<i>t</i>	<i>p</i>	<i>d</i>	Pre-intervention mean (sd)	Post-intervention mean (sd)	<i>t</i>	<i>p</i>	<i>d</i>
HADS-A	9.2 (3.2)	8.3 (3.4)	1.74	0.09	0.27	9.4 (3.1)	7.2 (3.1)	3.7	0.001	0.71
SF36pf	41.5 (32)	41.4 (31.6)	0.79	0.94	−0.08	38.3 (30.0)	41.3 (29.2)	−2.08	0.05	−0.10
EuroQol										
EQ5D	0.56 (0.3)	0.59 (0.3)	0.86	0.40	−0.10	0.57 (0.3)	0.63 (0.2)	−1.37	0.18	−0.24
VAS	62.0 (16.9)	63.6 (17.0)	−0.89	0.38	−0.09	62.7 (13.9)	65.4 (16.5)	−1.09	0.29	−0.06
SPSI-R										
PPO	10.6 (2.7)	10.8 (2.6)	−0.55	0.59	−0.08	10.0 (2.6)	11.4 (2.3)	−2.19	0.04	−0.29
NPO	18.0 (5.4)	15.6 (6.3)	3.00	0.004	0.41	19.5 (4.8)	15.3 (6.0)	3.93	0.001	0.78
RPS	36.9 (9.1)	37.1 (11.5)	−0.18	0.86	−0.02	36.0 (9.3)	39.7 (11.3)	−2.60	0.02	−0.36
ICS	16.5 (4.9)	16.7 (5.4)	−0.38	0.71	−0.04	17.2 (4.7)	16.9 (5.3)	0.33	0.75	0.06
AS	11.3 (3.9)	10.6 (5.5)	1.01	0.32	0.15	12.2 (4.0)	10.3 (6.0)	1.81	0.08	0.38

HADS = Hospital Anxiety and Depression Scale, SF36pf = Short Form-36 physical functioning subscale, SPSI-R: PPO = positive problem orientation; NPO = negative problem orientation; RPS = rational problem solving; ICS = impulsivity/carelessness style; AS = avoidance style, EQ-5D = EuroQol-5D, EQ-VAS = EuroQol-Visual Analogue Scale.

eight percent of the completers ( $n = 23$ ) vs 14% of the non-completers ( $n = 21$ ) met the criteria for reliable change on the BDI-II ( $\chi^2 = 18.008$ ,  $p < 0.001$ ). Although a large part of patients still scored within the depression range ( $BDI > 13$ ) at post-treatment, about one-third of patients (29.5%) showed a reduction in depressive symptoms. Recovery rate differed between completers (52.2%) and non completers (4.8%) ( $\chi^2 = 11.854$ ,  $p = 0.001$ ).

## 5. Discussion

This pilot study provides evidence that an adjusted version of web-based PST is a feasible treatment for depressive symptoms in patients with MS. More than half of the patients (52%) completed the intervention and the majority (85%) reported to be satisfied with this web-based intervention. Furthermore, our preliminary findings indicate that the intervention can reduce depressive symptoms in MS patients, especially in those who report more depressive symptoms at baseline and complete the intervention. Apparently, this subgroup of patients could benefit most from this kind of treatment.

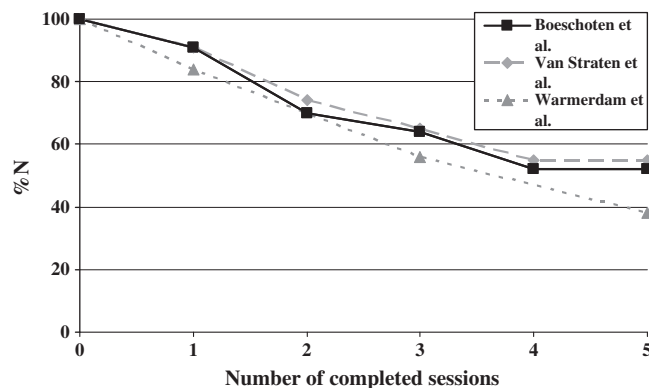
Our findings are in line with previous research that indicates that PST improves depressive symptoms. A recent meta-analysis reported mean pre-PST scores of 24.0 ( $sd = 7.3$ ) and post-PST scores of 11.2 ( $sd = 11.2$ ) on the BDI and BDI-II for depressed participants over eight studies [37]. This is comparable to our observations in completers, although it should be noticed that this meta-analysis was based on studies that were carried out in other (not MS) populations using another form of PST (not web-based). Apart from a decrease in depressive symptoms, we also found the web-based intervention to improve problem solving skills (negative and positive problem orientation and rational problem solving) and reduce anxiety. However, the intervention did not improve the specific problem solving styles of impulsivity/carelessness and avoidance, quality of life and physical functioning.

These results are encouraging since depression in MS patients often goes undiagnosed [7,8], and if diagnosed, adequate treatment tends to be lacking [1,10]. The fact that 36% of the responding patients ( $n = 150$ ; before inclusion) in our study had mild to severe depressive symptoms, and only four patients were receiving psychotherapy, underscores these findings. With a web-based intervention we might reach the group of un-served MS patients who are in need for suitable, easily-accessible treatment for their depressive complaints. In our study 58% of the approached patients agreed to participate. While this is only part of the target population, this number seems relatively high in comparison to a similar study in diabetes patients [38]. However, of the approached patients who agreed to participate only half completed the intervention.

Although web-based treatment has the advantage of reaching a large number of people, it raises the risk of dropout since this kind of treatment is fully the participant's own responsibility. In web-based self-help

treatment, it is much easier to postpone or end treatment when an effect is noticed or when the symptoms become less urgent [39]. Recently, a meta-analysis [40] suggests that people with less severe psychological difficulties were more likely to drop out of web-based treatment which is consistent with our finding that patients with less depressive symptoms at baseline were more prone to drop out of the intervention than those with a higher baseline level of depressive symptoms. We compared the compliance rate in this study with other studies examining a similar web-based PST intervention (Fig. 3). The compliance rate of our study (52%) was comparable to the compliance rates found in those studies (55% [33] and 38% [15]). In addition, a recent meta-analysis found no differences in dropout rates between face-to-face psychotherapy and guided web-based self-help [21]. However, high dropout percentages from web-based interventions have been identified as a major challenge in e-health interventions [41]. Additional research would be needed to understand and prevent dropout in (future) web-based treatment [40]. As reasons for early termination of the intervention, our patients reported computer related problems, a lack of time or being too busy. This is in line with several qualitative investigations of patient's reasons for dropping out of web-based treatment [40]. Still, little is known about the specific factors that could increase compliance rate [42].

Attempts to reduce dropouts contain for example modification of the intervention and sending postcard reminders or adding phone calls [43]. Recently, Mohr and colleagues [42] executed a single-arm feasibility trial to investigate the feasibility of a multimodal e-mental health treatment for depressed patients and suggested that joint effects of internet and telephone administered treatment for depression are promising. In order to further increase the compliance rate, telephone support could be considered in addition to, or instead of, email support [15,44]. More support or time to practice with the website before the



**Fig. 3.** Compliance rate of the web-based intervention compared with similar interventions.

start of the intervention could reduce dropouts in the beginning due to start up problems.

Although the outcome of the web-based intervention seems to be promising, further research should include a control condition to confirm that the observed improvement does not represent the natural course of depressive symptoms in patients with MS. However, several studies have shown that depression in MS patients appears to be stable over time and does not diminish automatically without treatment [45,46]. A randomized controlled trial with a longer follow-up and a larger sample size is necessary to determine whether the web-based PST intervention is indeed more effective than MS care as usual and to assess its consequences in the long term. In our study, MS diagnoses were obtained by self report on medical data and not checked afterwards with the neurologist. As a result, MS diagnosis was unknown for 11% of the patients. A written confirmation of the diagnosis from the patient's neurologist would enhance reliability. Finally, cognitive behavior therapy for depressive symptoms has shown to also reduce fatigue symptoms in MS patients [47]. In line with this, web-based PST for depression could improve both depressive and fatigue complaints in MS patients. It would therefore be interesting to additionally examine fatigue measures as outcome.

In conclusion, the results of this pilot study are encouraging and support the initiation of a randomized controlled trial to more elaborately investigate the effectiveness of a web-based PST intervention for depressed MS patients. This intervention could especially benefit those who experience disease-related or other barriers to participation in face-to-face counselling. With an easily accessible, cost-effective web-based self-help intervention we can reach and treat many MS patients with depressive symptoms and improve the quality of care.

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## Conflict of interest

There are no conflicts of interests for all authors.

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